Water, A Vital & Valuable Natural Resource
Green Solutions Position Paper

Executive Summary

POSITION

Kansas Citians value natural resources. We value open space, tree lined stream corridors and wildlife habitat. We value clean streams, lakes and rivers. We use and enjoy trails and eagerly pursue recreational activities that connect us to these natural areas. Surveys of Kansas Citians consistently confirm that protecting our natural resources is a top priority to a majority of our community. According to the 2006 Wet Weather Solutions Program Public Opinion Survey results, more than three-quarters (77%) of the residents surveyed thought City leaders should place a very high or high priority on maintaining and protecting streams. Ninety-two percent (92%) of those surveyed also indicated that they valued natural resources.

Historically, our most valuable natural resource – water -- has often been a destructive force. Floodwaters have caused damage to structures throughout the community. Citizens have lost their lives during flood events. Our waterways are being polluted by both humans and animals. Our sewer systems can be overwhelmed by too much water, causing sanitary sewers to overflow. The methods and practices of the past clearly are not working. We need to develop new solutions that will solve these issues, or we risk destroying the very resources that we value, and jeopardizing human health and the quality of life that we enjoy in Kansas City.

Citizens know that clean water in our urban rivers and streams is a key to a healthy community with abundant recreational opportunities. The Wet Weather Community Panel strongly believes that *green solutions* must be a comprehensive and fully integrated part of Kansas City's Wet Weather Solutions Program. *Green solutions* are strategies that result in on-the-ground projects which are specifically designed to reduce stormwater runoff, reduce water pollution, create recreational amenities, and protect our natural resources through the use of "green infrastructure" (also referred to as "natural systems") such as rain gardens, bio-retention facilities, stream restoration, stream buffers and other scientifically proven methods.

RECOMMENDATIONS

The task of the City's Wet Weather Solutions Program is to find ways to address some of the concerns that our community faces in managing water. This program will be the largest public infrastructure investment in our community's history. If Kansas Citians are to support such a significant investment, then we deserve to see this investment result in the protection and enhancement of the natural resources we value so highly. Kansas City can create a city rich with natural resources by adopting the following basic philosophy, which serves as the basis for a *green solutions* approach:

Water is a vital and valuable natural resource.
Protecting water as a valuable resource is a top priority.

Protecting water as a valuable resource means:

- Keeping stormwater where it falls, using native landscaping to treat the pollutants and reducing the amount of stormwater that leaves the site.
- Keeping buildings away from streams and using native vegetation to filter stormwater pollutants before they enter the streams.
- Creating multiple benefits when managing stormwater; incorporating water as a design feature and amenity.

Creative partnerships, focused land conservation and restoration, community education, development incentives, regulations and sustainable infrastructure projects are all ***green solutions.*** All are critical if we are to succeed in protecting water as a valuable resource. Every decision should be viewed as an opportunity for a ***green solutions*** approach.

CONNECTIONS

The philosophy and recommendations of the Wet Weather Community Panel are consistent with existing City policy and past actions such as:

- Adoption of American Public Works Association (APWA) 5600 stormwater standards and Best Management Practice (BMP) manual which improve the design of new development.
- Adoption of Erosion and Sediment Control standards which improve the construction of new developments and protect streams from sediment.
- Adoption of Climate Protection Plan Phase I Recommendations which recognizes the multiple benefits of green solutions.

ACTIONS

This position paper sets out specific ***Green Solutions Implementation Strategies*** that the Wet Weather Community Panel strongly recommends in order to achieve the protection of water as a valuable resource. We believe that successfully pursuing the strategies laid out in this paper will result in measurable social, economic and environmental benefits that will enhance the quality of life for all Kansas Citians.

Position Paper

PURPOSE

The purpose of this position paper is to advocate for adoption of a formal policy for the City of Kansas City Missouri that recognizes water as a vital and valuable natural resource, and that integrates the protection of water into every component of the City's comprehensive Wet Weather Solutions Program plan. This position paper sets out implementation strategies for developing a comprehensive approach to water protection, an approach that has been defined as "Green Solutions."[1]

KANSAS CITY'S WET WEATHER SOLUTIONS PROGRAM

The Water Services Department of the City of Kansas City has been tasked, through the mandates of the federal Clean Water Act and otherwise, with developing a comprehensive solution to addressing some of the water issues faced by the City, such as flooding, deteriorating sewers, sewer overflows and pollution of our urban creeks and streams. In order to facilitate a comprehensive, holistic approach, three divisions of the Water Services Department, the Overflow Control Program (OCP), the Stormwater Utility Division, and the Waterways Division, were combined, in a comprehensive approach dubbed the Wet Weather Solutions Program.

In 2003, Mayor Barnes appointed a citizen's advisory board, known as the Wet Weather Community Panel (Panel), to provide citizen input to the City's Wet Weather Solutions Program Team. The Panel developed a set of goals, or desired outcomes, to guide their work, listed below in no particular order:

- *Goal:* Minimize loss of life and injury and reduce property damage due to flooding.
- *Goal:* Improve water quality.
- *Goal:* Maximize economic, social and environmental benefits, optimize infrastructure investment and enhance natural habitats.

A subcommittee of the Panel was formed, known as the Green Solutions Subcommittee. The Subcommittee's task was to focus on strategies that recognize the importance and role of green infrastructure – trees, vegetation, wetlands, and preserved open space – in mitigating negative environmental impacts and enhancing the quality of life for all of our citizens. The Green Solutions Subcommittee identified the need for a broad city policy, focusing on the protection of water as a vital and valuable natural resource, as critical to the integration of green infrastructure into the City's comprehensive Wet Weather Solutions Program plan. This position paper is the result of the Subcommittee's efforts.

TOWARD A STEWARDSHIP ETHIC

Kansas City, like many cities across the country, faces immense challenges in addressing issues associated with stormwater management and the control of sanitary sewer overflows. Substantial resources will be needed to adequately address these challenges and every resident will be

[1] The term "Green Solutions" was chosen, in lieu of the more traditional terminology of "green infrastructure," to denote an approach that encompasses not only the use of natural systems on the ground, but also includes changes in traditional planning and management practices that encourage and enhance the use of natural systems.

impacted. Citizens, through various public participation avenues and opinion surveys, have indicated a recognition and preference for Green Solutions as an integral element of these future investments. (Attachment A)

87% of those surveyed in the 2006 Wet Weather Solutions Program Public Opinion Survey indicated that they would support an ordinance that would require developers to protect streams and stream corridors when land is developed.

When the concept of Green Solutions is understood, the benefits of a Green Solutions approach to urban growth and resource management can not be ignored. An efficient, effective approach to addressing wet weather issues in Kansas City, one that works with nature and not against it, makes absolute sense. Kansas City is poised to experience an "environmental revolution". Problems of climate change, water quality, waste management and deteriorating infrastructure demand a substantial shift in how Kansas City approaches urban growth and management of its existing resources. A new environmental ethic that values the stewardship of our natural resources and assets as an essential part of our economic and social well-being is emerging. This is what the citizens of Kansas City are demanding, to meet the high standards for the quality of life that we expect and deserve.

This does not mean that growth or redevelopment can not occur, but it needs to happen differently than the traditional approach of the last century. The goal is to ensure approaches that preserve natural resources and that maximize economic, social, and environmental benefits. Green Solutions promote sensitive development in appropriate locations while preserving existing natural attributes of the landscape, including our urban streams and rivers, so they can continue to perform their essential functions.

Recently, the City took steps to minimize the deterioration of our urban streams through the adoption of new drainage standards, a stormwater best management practices manual, and sediment and erosion control design standards. Implementation of these new criteria will begin to address decreasing water runoff by requiring the treatment of runoff from new development and significant redevelopment, and by controlling runoff from construction sites.

Implementation of the Green Solutions Strategies recommended in this position paper is the next critical step that the City must take to further reduce the negative environmental impacts of stormwater runoff and wastewater discharges to our urban rivers and streams.

EPA ENCOURAGES GREEN SOLUTIONS

The U.S. Environmental Protection Agency (EPA) is responsible for protecting human health and the environment. One of the federal laws which EPA is mandated to enforce is the Clean Water Act, the goal of which is protect our nation's water resources, including our urban rivers and streams. The City of Kansas City must comply with the Clean Water Act requirements, and as a part of compliance the City must submit a plan to EPA and the State of Missouri detailing how it intends to meet certain of the statute's requirements relating to sewer impacts on our urban waterways. This plan will require significant public infrastructure investment, perhaps the largest public infrastructure investment in our community's history.

In March of this year (2007), EPA issued a policy memo by Assistant Administrator Benjamin Grumbles that encourages the use of green infrastructure as a significant and valued component of

community efforts to meet regulatory requirements related to a broad range of water quality standards (see Attachment B). The importance of this policy statement can not be overlooked as the City works toward submission of its plan, in 2008, for meeting the Clean Water Act requirements.

The EPA memo concisely outlines the numerous benefits of green infrastructure:

- Cleaner Water
- Enhanced Water Supplies
- Cleaner Air
- Reduced Urban Temperatures
- Increased Energy Efficiency
- Community Benefits
- Cost Savings

Issuance of the Grumbles policy memo by EPA gives Kansas City a unique opportunity to develop its own policy to integrate Green Solutions into its comprehensive Wet Weather Solutions Program plan. The benefits of this approach are obvious.[2]

While the emphasis of the work done by the Panel is water quality, the interconnected and interdisciplinary nature of environmental issues should not be overlooked. The City is currently undergoing a comprehensive climate change planning process, with the first phase recommendations unanimously approved by the City Council (April 12, 2007). That climate change planning process acknowledges the benefits of a green infrastructure approach in sequestering carbon, improving air quality, and mitigating urban heat island effects.

GREEN SOLUTIONS REDUCE COSTS AND ENHANCE QUALITY OF LIFE

The book *Green Infrastructure: Linking Landscapes and Community* (Benedict and McMahon, 2006) provides an extensive description of the many benefits of a green infrastructure approach. One paragraph that captures the essence of this states:

> "By protecting key landscapes and natural systems, green infrastructure helps to reduce the cost of providing community services and building water retention, filtration, and drainage systems that are needed when natural systems cannot perform their natural functions. The cost savings realized are multiplied by the tax revenues brought about by an increase in the value of homes and the desirability of the community as a site for new commercial enterprises. Perhaps most important of all, the enhanced quality of life the green infrastructure offers communities benefits all who live there." (Page 78)

[2] The EPA memo also references a June 2006 document issued by the Natural Resources Defense Council entitled Rooftops to Rivers: Green Strategies for Controlling Stormwater and Combined Sewer Overflows. This document highlights the role of green infrastructure in dealing with these issues and provides a list of policy directions for local decision makers – a "top nine" list of actions communities should implement to achieve the benefits of a green solutions. This listing formed the basis for the development of the Green Solutions Implementation Strategies included as part of this paper.

One critical component of a Green Solutions approach in Kansas City is the adoption of a progressive stream buffer ordinance that will significantly protect stream integrity, improve water quality, and result in a number of "greenways" of preserved trees and vegetation. Many of these greenways will provide the basis for an extensive network of neighborhood and community trails that will be part of the regional network known as MetroGreen.

The economic value of amenities such as greenways, trails and other open space areas is documented by the preferences of home buyers and the price premiums homeowners are willing to pay to live in proximity to them. This is a real world measure of the intrinsic value people place on these attributes and their ability to enhance our quality of life.[3]

GREEN SOLUTIONS' SUCCESS STORIES

Several cities around the country have begun to implement green infrastructure concepts for all the reasons mentioned above. Based upon data and analysis of a number of the green infrastructure projects utilized in other communities faced with issues similar to those in Kansas City (such as Chicago, Portland, Toronto and others), Camp, Dresser and McKee, a well-known, national engineering consulting firm, identified the following attributes of a green solutions approach:

1. Green solutions primarily provide stormwater quality benefits, with combined sewer overflow (CSO) volume reduction a secondary benefit
2. Green solutions utilize a "decentralized approach" to address stormwater problems at the source throughout the watershed
3. Green solutions are important for redevelopment as well as developing areas and are key to preserving the integrity of control plans
4. Green solutions achieve multiple benefits, beyond just water quality improvements, which enhances their cost-benefit basis

CONCLUSION

The Wet Weather Community Panel strongly recommends adoption of a formal Green Solutions policy by the City Council that will focus city resources on preserving and enhancing the City's natural resources as an integral part of the City's comprehensive Wet Weather Solutions Program plan. For the reasons stated in this position paper, the Panel believes that integration of Green Solutions into the City's comprehensive Wet Weather Solutions Program plan is critical to maximizing the social, economic and environmental benefits that enhance the quality of life for all Kansas Citians. A City policy recognizing the value of Green Solutions and directing City departments to coordinate actions to maximize the use of green infrastructure concepts is a vital, positive step to significantly improving the future of our City.

---

[3] Kansas City's comprehensive plan known as FOCUS (Forging Our Comprehensive Urban Strategy), completed after an intensive multi-year community involvement process, lays the foundation for the future of the City. One emphasis was that "quality development" is essential to creating a place where people want to live and to avoid repeating past development patterns that create detrimental effects, increase infrastructure costs, and negatively impact quality of life. FOCUS emphasizes that if we develop with quality the first time, quantity (economic growth) will come. Kansas City is increasingly recognized as a desirable place to live, work, and play.

Green Solutions Implementation Strategies

INTRODUCTION:
Water is a vital and valuable natural resource. Protecting water as a valuable resource is a top priority. The following Implementation Strategies describe steps to be undertaken to fully integrate the multiple benefits of Green Solutions into Kansas City's comprehensive Wet Weather Solutions Program plan.

Implementation Strategy: *Educate and engage the public. Create community and regional partnerships.*

Action Steps:

- Implement a large scale, well-targeted public education campaign encouraging citizens to prevent pollution and be part of the solution.
- Develop and implement a Wet Weather Community Panel public advocacy campaign.
- Institutionalize the Wet Weather Community Panel giving it a long-term role.
- Build community and political leadership.
- Provide opportunities for citizen input and make decisions utilizing this input.
- Fund staff position(s) responsible for building internal and external partnerships and dedicated to implementing green, multi-benefit solutions.
- Support multi-jurisdictional efforts aimed at planning and implementing a green, multi-benefit solutions approach.
    - Formalize agreements with other political jurisdictions sharing watersheds with Kansas City to promote and develop projects on a regional, watershed basis.
    - Develop, fund and implement projects designed to maximize efficient use of resources from a watershed perspective.

Accomplishments:

- ✓ Formed Wet Weather Community Panel in 2003
- ✓ Formed 12 Basin Coordinating Committees
- ✓ Created 10,000 Rain Gardens Initiative
- ✓ Conducted Wet Weather Fairs
- ✓ On-going presentations to existing community groups
- ✓ Prepared websites, handout materials, videos and television programming
- ✓ Participating in regional watershed management planning and public education programs
- ✓ On-going Municipal Separate Storm Sewer System (MS4) permit compliance activities.

Implementation Strategy: *Enact regulations and create enforcement programs that protect natural resources. Modify or eliminate any ordinance provision or enforcement practice that discourages the use of green, multi-purpose solutions.*

Action Steps:

- Create procedures for City staff from different departments to work together to integrate green solutions into planned projects.
- Train City staff to better understand green solutions and to think more holistically to integrate green solutions into projects whenever feasible.
- Enact and enforce the stream setback ordinance.
- Modify design standards for streets and sidewalks to minimize impervious area and to include green solutions such as bio-filters and rain gardens.
- Work with APWA and other regional organizations to update stormwater standards, to define "low impact development" as it pertains to the Kansas City metropolitan area and incorporate those concepts into city planning and development regulations.
- Amend the development code to encourage low impact development through incentives and flexible regulations.
- Amend stormwater design regulations to further limit rates, volumes and frequencies of stormwater for redevelopment projects – using redevelopment as an opportunity to make our community better than the status quo.
- Adequately fund planning and enforcement programs and proactively enforce regulations.
- Evaluate development review procedures and capital project development procedures to ensure that they result in green, multipurpose approaches.
- Obtain dedication of easements in riparian buffer where appropriate so that future trails can connect people to the resource.
- Require city projects to meet standards and showcase best practices.
- Adopt KC-One Stormwater Management policies.

Accomplishments:

- ✓ Adopted updated stormwater design standards American Public Works Association (APWA) Section 5600 and Best Management Practices Manual as mandatory regulation.
- ✓ Adopted updated stormwater management construction standards American Public Works Association (APWA) Sections 2100 and 5100 with supplemental city criteria.

Implementation Strategy: *Create incentives to integrate green solutions into the community.*

Action Steps:

- Create incentive programs that encourage developers, neighborhood organizations and owners of industrial, commercial and residential properties to install and maintain micro Best Management Practices (BMPs) for stormwater quality and quantity management.
    - Facilitate project development
    - Provide design assistance
    - Offer a credit or fee deduction
    - Reduce development approval timeframe (e.g. move these projects to the "front of the line.")
    - Provide special recognition within the community for these entities
    - Provide matching funds or grants
- Develop standards for integrating green solutions into private projects receiving government funding or that are city funded (example Tax Increment Financing).
- Identify green solutions as a funding priority for infrastructure/capital improvements.

Accomplishments:

✓ Adopted Leadership in Energy Efficient Design (LEED) in city buildings by ordinance.

Implementation Strategy: *Invest public dollars in green, multi-benefit solutions.*

Action Steps:

- Set targets for percent of open space within city limits and track progress
- Incorporate green solutions into Long-Term Control Plan for the combined sewer system.
    - Require green solutions to be integrated into every basin.
    - Include green solutions in negotiations with state and federal regulatory agencies.
- Enact a comprehensive urban forestry program with the goals of increasing urban canopy by at least 10%.
- Retrofit existing stormwater management facilities (such as detention basins) to function for water quality as well as quantity.
- Install native landscaping on public right-of-ways.

- Build demonstration or “signature” projects to gather data. Analyze effectiveness and showcase proactive green solutions. Utilize data from other sources (local, state and national) to promote proactive green solutions.
- Maximize the useful life and performance of facilities by fully funding an aggressive preventative maintenance program.
- Establish a sustainable, dedicated funding source(s) for green, multi-benefit solution projects identified in KC-One report.
- Establish dedicated funding source that promotes the integration of green, multi-benefit solutions.
- Work in tandem with other jurisdictions in the metro to pursue funding and appropriate siting for green, multi-benefit solutions.
- Restore public lands to function as natural systems for stormwater management.
- Provide regional land managers with sufficient resources to protect and restore public lands.
- Research and implement new and innovative methods for natural resource protection.
- Educate public and private land managers on best practices for natural resource management.
- Consider life-cycle costs when analyzing the cost-effectiveness of green solutions.
- Consider the long-term, ancillary value of green solutions.

Accomplishments:

✓ Adopted Climate Protection Plan, Phase I recommending green, multi-benefit solutions.

Attachment A

Wet Weather Solutions Program
2006 Public Opinion Survey Summary Report
Executive Summary

Wet Weather Solutions Survey Summary Report ALL BASINS

conducted for

The City of Kansas City, Missouri
Water Services Department

by

ETC Institute
725 West Frontier
Olathe, Kansas 66061
(913) 829-1215

May 30, 2006

Wet Weather Solutions Survey
Executive Summary

Methodology

ETC Institute administered a survey for the City of Kansas City, Missouri, Water Services Department during the spring of 2006. The purpose of the survey was to objectively gather input from residents in order to plan improvements related to the City's Overflow Control Program and Stormwater Management Plan.

During March 2006, ETC Institute mailed a four-page survey to a stratified random sample of more than 14,000 households in Kansas City. The sample was designed to ensure the completion of at least 400 households in each of twelve basins. Approximately seven days after the surveys were mailed, residents who received the survey were contacted by phone. Those who indicated that they had not returned the survey were given the option of completing it by phone. Of the households who received a survey, a total of 5,430 completed the survey. The results for the stratified random sample of 5,430 households have a 95% level of confidence with a precision of at least +/- 1.5%. There were no statistically significant differences in the results of the survey based on the method of administration (phone vs. mail).

All survey responses were geocoded to the parcel identification number (KPIN) for the responding households to allow the information from the survey to be integrated with geographic information systems (GIS) that are used by the City.

This report contains (1) a summary of the major findings, (2) charts depicting the overall results of the survey, (3) crosstabulations that show the results for each of the 12 basins, (4) tabular data for the overall results to each question on the survey, and (5) a copy of the survey instrument.

Major Findings

- More than half (77%) of the residents surveyed thought City leaders should place a very high or high priority on maintaining and protecting streams; 2% thought it should be a low priority, and 21% gave a medium priority rating.

- 92% of those surveyed indicated that they valued natural resources.

- 77% of those surveyed thought that the quality of local streams affects property values.

- 87% of those surveyed thought that it was important to improve water quality in streams in Kansas City.

- 85% of those surveyed thought that it is was important to make improvements that would minimize sewer overflows into creeks and streams during heavy rains.

- 87% of those surveyed indicated that they would support an ordinance that would require developers to protect streams and stream corridors when land is developed.

How Residents Thought the Quality of Water in Lakes, Rivers, and Streams Is Changing

- 32% of the residents surveyed felt that the quality of water in lakes, rivers and streams in the area where they live is getting much worse or somewhat worse; 10% thought it is getting better; 25% thought it was staying about the same, and 33% did not have an opinion.

Perceived Sources of Water Pollution

- 43% of the residents surveyed thought that stormwater was the greatest contributor to pollution of local waters.

- 27% of those surveyed thought that industrial discharge was the greatest contributor to pollution of local waters.

Participation in Recreational Activities in and Around Lakes, Rivers, and Streams

- 45% of the residents surveyed indicated that they had participated in hiking and walking near lakes and streams in the City of Kansas City during the past year; 29% had participated in picnicking, and 23% had participated in fishing.

- 8% of the residents surveyed indicated that they would consider swimming in lakes and streams in the Kansas City area during or immediately after a rainstorm; 92% would not.

Actions Residents Would Be Willing to Take to Reduce Pollution in Lakes, Rivers, and Streams

- 93% of the residents surveyed indicated that they would be very or somewhat willing to dispose of hazardous waste at a collection site.

- 84% of the residents surveyed indicated that they would be very or somewhat willing to sweep excess fertilizer and grass onto the lawn.

- 83% of those surveyed indicated that they would be very or somewhat willing to landscape their yard with plants.

Opportunities to Educate Residents

- Only 8% of those surveyed knew that they lived in a watershed.

Where Residents Get Information About Sewer Overflows and Stormwater Management Issues

- 49% of the residents surveyed had seen or heard information about sewer overflows, water quality or stormwater management during the past year.

- Among those who had seen or heard information, 66% got their information from television, 54% got their information from a bill insert, and 49% got their information from newspapers.

Sources of Basement Flooding

- 33% of the residents surveyed indicated that they had water in their basement from surface flooding or sewer backups in their current neighborhood at least once.

- Of those who had water in their basement, 60% indicated that rainwater that entered through cracks in the foundation and floors was the source of the flooding; 40% indicated the source was caused by sewer backups through floor drains.

Funding Issues

- 62% of those surveyed indicated that they would be willing to pay at a sales tax increase of 1/8th cent to fund improvements to the City's stormwater and sanitary sewer system, but only 17% were willing to pay an increase of ½ cent or more.

- 50% of those surveyed indicated that they would be willing to pay an increase of at least $5 per month in utility fees to fund improvements to the City's stormwater and sanitary sewer system, but only 2% were willing to pay more than $10 per month.

Attachment B

United States Environmental Protection Agency
Memorandum from Benjamin Grumbles, Assistant Administrator
To EPA Regional Administrators

"Using Green Infrastructure to Protect Water Quality in Stormwater, CSO, Nonpoint Source and other Water Programs"
Dated March 5, 2007

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 5 2007

OFFICE OF
WATER

MEMORANDUM

SUBJECT: Using Green Infrastructure to Protect Water Quality in Stormwater, CSO, Nonpoint Source and other Water Programs

FROM: Benjamin H. Grumbles
Assistant Administrator

TO: EPA Regional Administrators

Green infrastructure can be both a cost effective and an environmentally preferable approach to reduce stormwater and other excess flows entering combined or separate sewer systems in combination with, or in lieu of, centralized hard infrastructure solutions. EPA Water Programs are in a pivotal position to exert leadership in the consistent and reliable implementation of green infrastructure approaches. This memo is to highlight opportunities for the Regions, States, and Headquarters efforts to increase the development and use of green infrastructure in water program implementation.

Several cities, searching for alternatives to traditional hardscape solutions to wet weather discharge problems, have initiated some green infrastructure approaches. The Natural Resources Defense Council (NRDC) has recently published a document with information and case studies on these efforts. I strongly support the use of green infrastructure approaches described in the NRDC report and I suggest you share the report with States and promote other tools for green infrastructure. *Rooftops to Rivers: Green strategies for controlling stormwater and combined sewer overflows* (NRDC, June 2006) is available at:
http://www.nrdc.org/water/pollution/rooftops/contents.asp

Green infrastructure approaches essentially infiltrate, evapotranspirate or reuse stormwater, with significant utilization of soils and vegetation rather than traditional hardscape collection, conveyance and storage structures. Common green infrastructure approaches include green roofs, trees and tree boxes, rain gardens, vegetated swales, pocket wetlands, infiltration planters, vegetated median strips, reforestation, and protection and enhancement of riparian buffers and floodplains. Green infrastructure can be used where soil and vegetation can be worked into the landscape. It is most effective when supplemented with other decentralized storage and infiltration approaches, such as the use of permeable pavement, and rain barrels and cisterns to capture and re-use rainfall for watering plants or flushing toilets. These approaches can be used to keep rainwater out of the sewer system to reduce sewer overflows and to reduce the amount of untreated stormwater discharging to surface waters. Green infrastructure

facilitates or mimics natural processes that also recharge groundwater, preserve baseflows, moderate temperature impacts, and protect hydrologic and hydraulic stability.

Green infrastructure has a number of benefits:

- *Cleaner Water* – Vegetation and green space reduce the amount of stormwater runoff and, in combined systems, the volume of combined sewer overflows.
- *Enhanced Water Supplies* – Most green infiltration approaches result in stormwater percolation through the soil to recharge the groundwater and the base flow for streams.
- *Cleaner Air* – Trees and vegetation improve air quality by filtering many airborne pollutants and can help reduce the amount of respiratory illness.
- *Reduced Urban Temperatures* – Summer city temperatures can average 10°F higher than nearby suburban temperatures. High temperatures are linked to higher ground level ozone concentrations. Vegetation creates shade, reduces the amount of heat absorbing materials and emits water vapor – all of which cool hot air.
- *Increased Energy Efficiency* – Green space helps lower ambient temperatures and helps shade and insulate buildings, decreasing energy needed for heating and cooling.
- *Community Benefits* – Trees and plants improve urban aesthetics and community livability by providing recreational and wildlife areas and can raise property values.
- *Cost Savings* - Green infrastructure may save capital costs on digging big tunnels and stormwater ponds, operations and maintenance expenses for treatment plants, pipes, and other hard infrastructure; energy costs for pumping water; and costs of wet weather treatment and of repairing stormwater and sewage pollution impacts, such as streambank restoration.

The Office of Water is working with a coalition of organizations, including the Natural Resources Defense Council, the National Association of Clean Water Agencies, and the Low Impact Development Center, to develop additional strategies for green infrastructure approaches to water quality challenges. As those strategies take shape, we will send you additional tools and information on implementing green infrastructure in our water programs.

I am pleased that EPA Regions and States are looking for opportunities to incorporate green infrastructure. We would be very interested in hearing about your efforts, and to the extent they can be applied elsewhere, assist in disseminating information and tools. If you have any questions, please contact me or have your staff call Jenny Molloy at (202) 564-1939 with any questions, comments, ideas or information on green infrastructure approaches.

cc: Water Division Directors
OW Office Directors